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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,770	01/14/2004	Zheng Yuan	007443/P1	5493

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EXAMINER

STOUFFER, KELLY M

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 09/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/757,770

Applicant(s)

YUAN ET AL.

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 January 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/3/05 3/22/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent application and in the later-filed application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

The disclosure of the prior-filed application, Application No. 10/247,672 , fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application. The disclosure of 10/247,672 does not provide for a nickel silicide containing substrate or nickel silicide connectors as required by claims 4, 12; and 23.

Information Disclosure Statement

2. The information disclosure statement filed 14 January 2004 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all

Art Unit: 1762

other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Drawings

3. The drawings are objected to because:

Figure 2 is insufficiently represented and the reference numbers are difficult to read.

Reference number 5273 in Figure 5A should read —527—

Reference number 550 in Figure 5A is used to designate the processor, as defined in the specification but appears in the drawing a second time pointing to an undefined area.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

Art Unit: 1762

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract is currently objected to because it is too long. Appropriate correction is required.

5. The disclosure is objected to because of the following informalities:

TEPo occurs in several places in the disclosure beginning with paragraph 0011 line 6. This should read —TEPO—

Reference characters 106 in Figure 1, 565, 535, and 517 in Figure 5A and 529, 517, and 597 in Figure 5C are not defined in the specification.

The limitation of claim 4 that requires a substrate comprising nickel silicide connectors is not supported by the specification. The specification provides for nickel silicide in a substrate, but does not mention connectors.

Appropriate correction is required.

Claim Objections

6. Claims 14 and 24 are objected to because of the following informalities: TEPO in line 2 of claims 14 and 24 should be –TEPO–. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 8-11, 13-14, 19-22, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent number 6218268 to Xia et al.

Regarding claim 1, Xia et al. discloses a method of filing a gap defined by adjacent raised features on a substrate in column 1 lines 32-45. Xia et al. discloses a first step of using a flow of oxidizing, silicon-containing, and phosphorus-containing gas to deposit a BPSG film, or conformal layer, on a substrate and a second step of depositing another film, or bulk layer, using a flow of oxidizing, silicon-containing, and phosphorus-containing gas on a temperature below 500 °C throughout the deposition (column 2 lines 23-60). In order to form the film on the substrate of Xia et al., one of ordinary skill in the art would recognize that these gases must react with one another. The ratios of the gases can be varied when depositing the conformal layer (Figures 7A and 7B steps 706 and 709 show the ratio being reduced during the deposition, also column 13 lines 4-42) and are constant in the bulk layer. Thus, Xia et al. meets all the recitations of claim 1, at least as broadly recited by claim 1.

With regard to claims 8-11, Xia et al. includes the recitations as described in the paragraph above, and includes the substrate as a semiconductor (column 1 lines 15-20) and the BPSG layer formed as a pre-metal dielectric layer (column 9 lines 55-60). Again the substrate is maintained at a temperature below 500 °C during deposition, which one of ordinary skill in the art would recognize as below reflow temperature of the silicon oxide and an annealing step is not disclosed. Thus Xia et al. meets all the recitations of claims 8-11, at least as broadly recited by claims 8-11.

With regard to claims 13-14, Xia et al. includes the recitations of claim 13 as discussed above, and discloses the silicon gas as TEOS and the phosphorus gas as TEPO in column 6 lines 15-31. Xia et al. meets all the recitations of claims 13-14, at least as broadly recited by claims 13-14.

All of the elements of claims 19-22 and 24 are disclosed by Xia et al. as described above. Xia et al. meets all the recitations of claims 19-22 and 24, at least as broadly recited by claims 19-22 and 24.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

Art Unit: 1762

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xia et al. Xia et al. is described above and includes all of the provisions of claim 5 except a capping layer deposited at below 500 °C. Xia et al. teaches that a BPSG layer according to the described invention can be used in any of the dielectric layers 227, 228, and 229 in Figure 2 (columns 9 and 10 lines 55-3). The dielectric layers 227, 228, and 229 are shown to have three separate layers, the topmost of which can be considered a capping layer. It would have been obvious to modify the method of Xia et al. to include another layer in the disclosed process as a capping layer as shown in Figure 2 in order to make a layer that can be used in any dielectric layer in an integrated circuit.

Art Unit: 1762

9. Claims 2, 3, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xia et al. in view of US Patent number 6013584 to M'Saad. Xia et al. is described above and includes making patterned metal over the BPSG layers in column 10 lines 1-12. Xia et al. does not include keeping the temperature at the substrate below the temperature of the silicon oxide or annealing the substrate during patterning. M'Saad teaches that it is not necessary to reflow the film but one can use a chemical mechanical polishing technique to planarize the film before depositing the metal so the temperature would not be raised, and one would assume the temperature would not be raised to reflow temperature when dealing with BPSG films in order to not reach temperatures that are too high for thermal budgets required for advanced pre-metal dielectric layers in smaller geometries (column 2 lines 21-60).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Xia et al. to include the temperature of the substrate as below the reflow temperature during metal deposition as taught by M'Saad in order to meet thermal budgets required for advanced pre-metal dielectric layers in smaller geometries.

10. Claims 4, 12, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xia et al. in view of US Patent publication 2002/0050605 to Jeng. Xia et al. is described above and includes a BPSG layer as a pre-metal dielectric layer but does not include a substrate comprising nickel silicide. Jeng teaches using a substrate comprising nickel silicide when depositing a BPSG layer as a pre-metal dielectric layer because nickel silicide is known to have desirable characteristics for reduced line width devices. (Paragraph 0021 lines 12-14 and paragraph 0025 et seq.)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Xia et al. to include nickel silicide in the substrate as taught by Jeng in order to take advantage of the desirable characteristics of nickel silicide in reduced line width devices.

11. Claims 15-18 and 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xia et al. in view of US Patent number 6500771 to Vassilev et al. Regarding claims 15, 17, 25, and 27, Xia et al. is described above and includes a method for depositing BPSG that includes an oxidizing, silicon-containing, and phosphorus-containing gas or a plasma. Xia et al. does not include the phosphorus-containing gas flowing after the silicon-containing and oxidizing gas. Vassilev et al. includes a phosphorus-containing gas flowing after a silicon-containing and oxidizing gas in the form of plasma in column 15 lines 34-52 to limit unacceptable dopant migration during processing (column 2 lines 27-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Xia et al. to include the phosphorus-containing gas flowing after the silicon-containing and oxidizing gas in the form of a plasma as taught by Vassilev et al. in order to limit unacceptable dopant migration during processing.

Regarding claims 16 and 26, Xia et al. discloses the chamber pressure to be between 200 and 700 torr in column 13 lines 4-21.

Regarding claims 18 and 28, Vassilev et al. discloses the plasma density to be within a range including 10^{11} ions/cm³ in column 15 lines 63-65.

Art Unit: 1762

Conclusion


12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al., Kariya, Maeda et al. and Gabric et al. show similar procedures. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms


TIMOTHY MEESKS
SUPERVISORY PATENT EXAMINER